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**B01D 29/66**

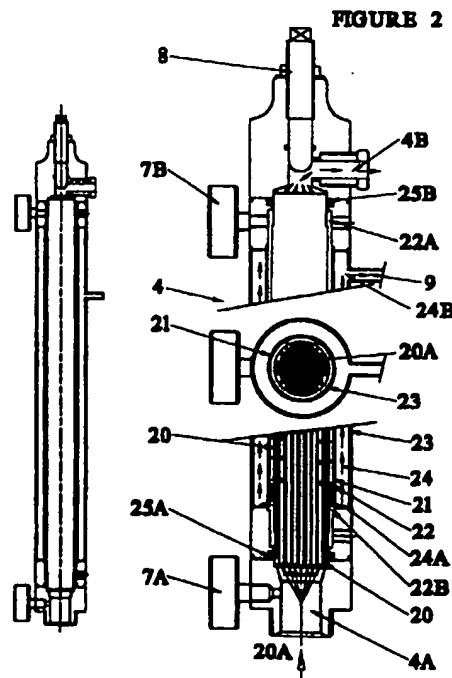
(52) UK CL (Edition T )  
**B1D DNCK**

(56) Documents Cited  
**GB 2335150 A** **US 3637079 A**

(58) Field of Search  
 UK CL (Edition S ) **B1D DDXB DNCK DNCL**  
 INT CL<sup>7</sup> **B01D 29/66 29/68**  
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(54) Abstract Title  
**Filter system**

(57) A filter system includes a liquid filter (4) to filter effluent into permeate. The filter (4) includes a ceramic filter (20) containing one or more hollow conduits (20A). One end of the filter conduit/s (20A) is connected to a filter flow inlet (4A) and the other end provides a flow outlet (4B). An inner hollow chamber around the filter has a sealed end (22A) and an open end (22B). An outer hollow chamber (24) is provided by an outer tube (23) around the inner chamber. The outer hollow chamber (24) has an inlet (24A) connected to the inner chamber open end (22B) and has an outlet (24B) forming the filter permeate outlet (9). A valve (10) connects a supply of compressed air to the outer hollow chamber (24). In use effluent to be filtered passes under pressure through the ceramic filter conduit/s (20A) from the flow inlet (24A) to the flow outlet (24B), and permeate is filtered out into the inner chamber and then flows into the outer hollow chamber (24). The outer hollow chamber (24) forms a reservoir of clean permeate to be forced back through the ceramic filter (20) by compressed air to clean the filter (4).



At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The claims were filed later than the filing date but within the period prescribed by Rule 25(1) of the Patents Rules 1995.

**GB 2 368 807 A**

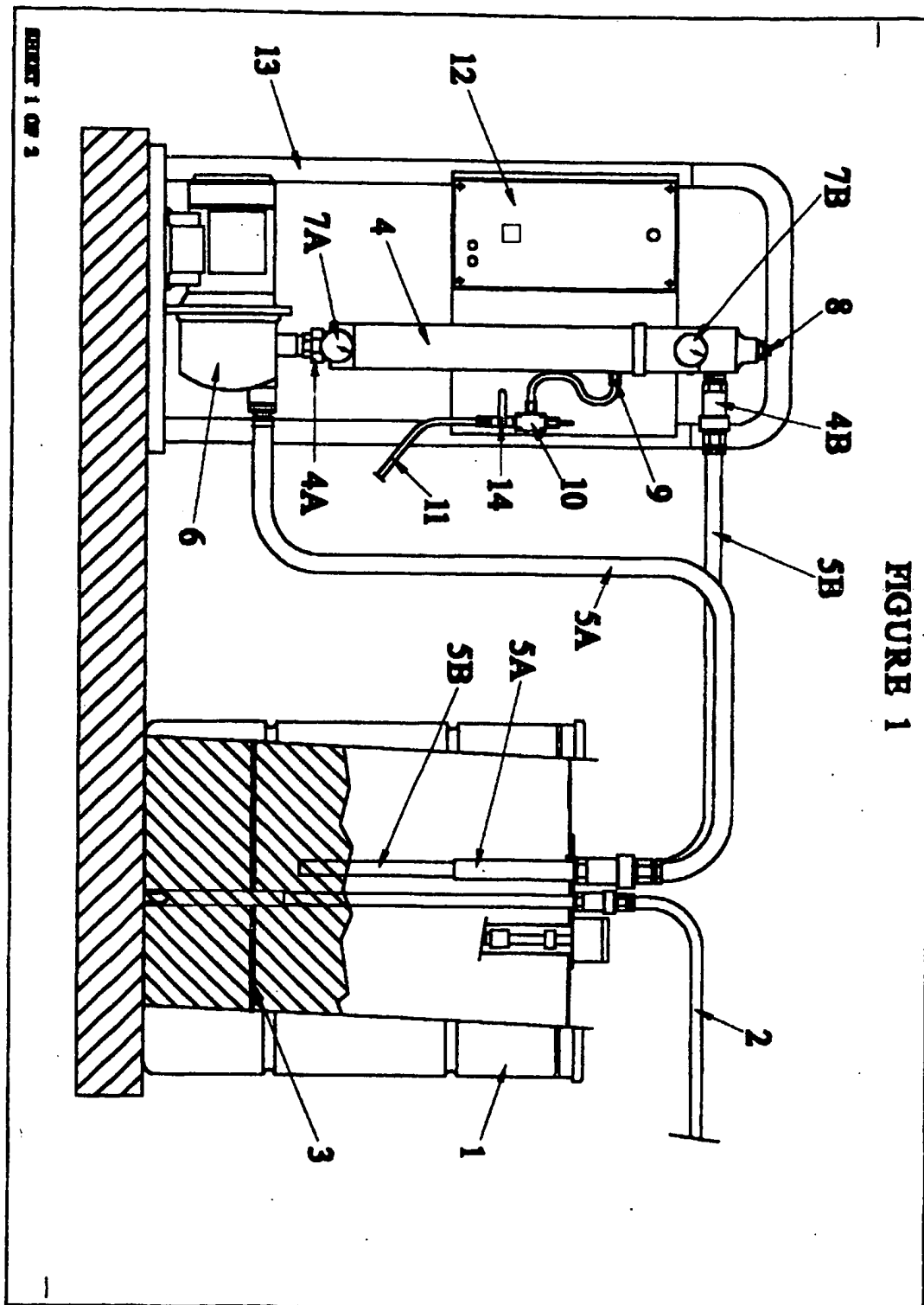
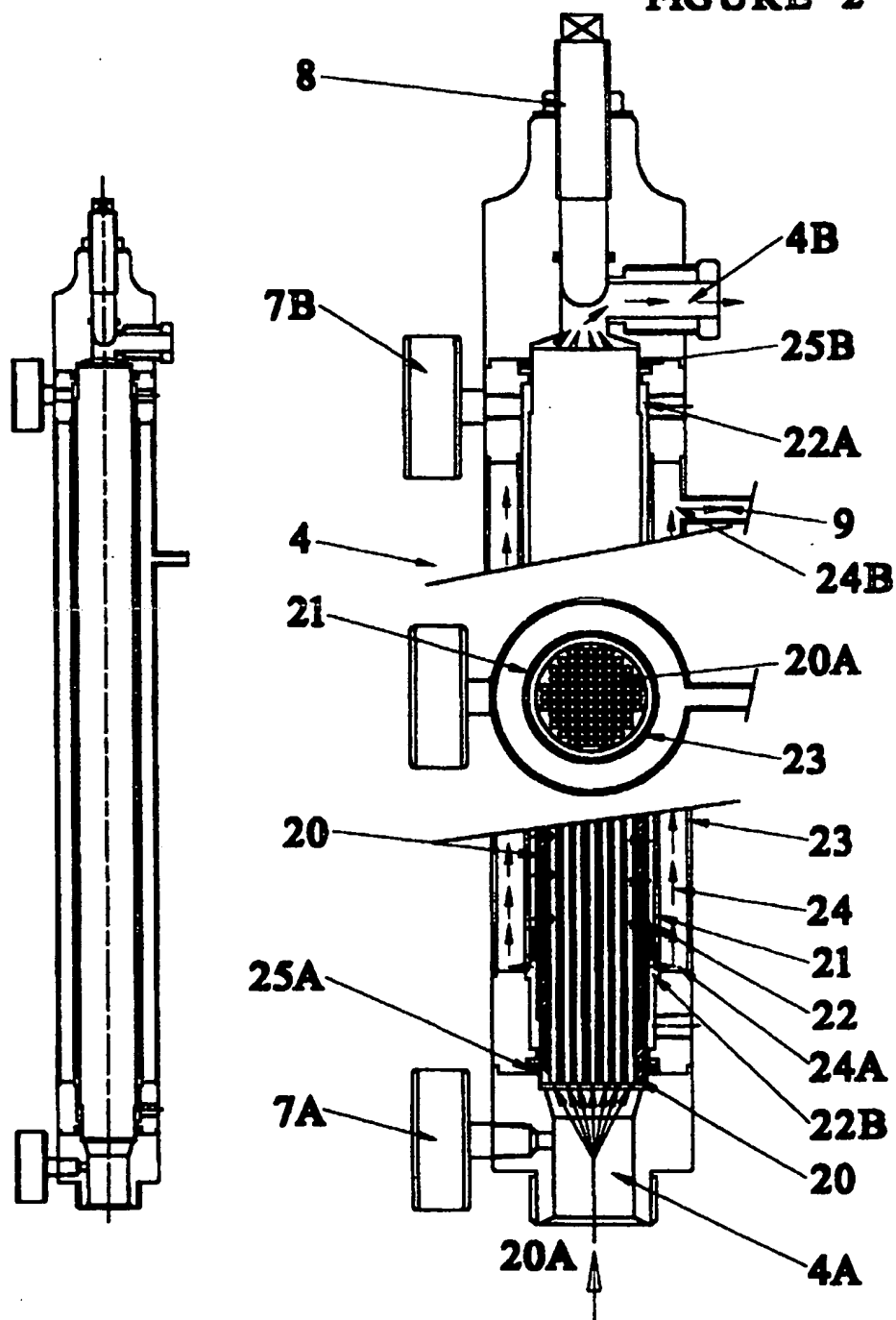


FIGURE 2



Title: Filter

The present invention relates to a filter, particularly to recover liquids.

It is well known to use filters to recover liquids so that their use can be extended. For example oil can be recovered from oil and water mixtures, or particles can be recovered from coolants such as cutting fluid used in machining metal. Some such filters use a ceramic filter which often consists of a tube with one or more hollow conduits through which liquid to be filtered is passed under pressure. The hollow conduits are often lined with a ceramic membrane. Liquid is filtered through the wall of the ceramic tube surrounding the conduits.

Over a period of time the membrane surfaces of the hollow conduits become blocked with debris and it is necessary to reverse flow clean filtered liquid back through the membrane into the conduits to remove this debris. This is often done by providing a reservoir of clean filtrate downstream of the filter system with a complex series of valves which allow the clean filtrate from the reservoir to be forced under compressed air back through the filter.

The invention seeks to provide a filter of the above type but which obviates the need for a reservoir and complex series of valves.

According to the present invention there is provided a liquid filter to filter effluent into permeate comprising:

- a) a ceramic filter containing one or more hollow conduits therein, one end of the filter conduit/s being connected to a filter flow inlet and the other end providing a flow outlet,
  - b) an inner hollow chamber around the filter having a sealed and open end,
  - c) an outer hollow chamber around the inner chamber, said outer hollow chamber having an inlet connected to the inner chamber open end and having an outlet forming said filter permeate outlet,
- and

- d) means to connect a supply of compressed air to the outer hollow chamber,

in use effluent to be filtered passes under pressure through the ceramic filter conduit/s from the flow inlet to the flow outlet, and permeate is filtered out into the inner chamber and then flows into said outer hollow chamber, the outer hollow chamber forming a reservoir of clean permeate to be forced back through the ceramic filter by means of said compressed air to clean the filter.

Preferably the ceramic filter is an elongate tube, and said inner and outer chambers are created by concentric tubes about said filter.

Preferably a control valve is provided to control the flow of effluent through said flow outlet whereby to alter the pressure of effluent in the ceramic filter conduit/s.

Preferably a two way valve is connected to the outer chamber outlet having a first position allowing the flow of permeate from the permeate outlet, and a second position connecting the supply of compressed air to the permeate outlet.

An embodiment of the invention will now be described with reference to the accompanying drawings in which:

Figure 1 shows a schematic diagram of a filter of the invention in an effluent cleaning system, and

Figure 2 shows a cross section view of the filter shown in Figure 1.

Referring to Figure 1 there is shown an effluent cleaning system. Effluent, such as used cutting fluid, is fed into a master container 1 from a transfer pipe 2. End of transfer pipe 2 passes down to the bottom of container 1 through a sieve 3 whereby large particles of metal are always contained in the lower part of container 1.

Effluent in container 1 is circulated through a filter 4 according to the invention. Effluent is drawn from just above the sieve 3 through a feed pipe 5A by means of pump 6. Pump 6 pressurises the effluent so that it passes through filter 4 and back into the container 1 through a return pipe 5B. A pair of pressure gauges 7A, 7B are provided at flow inlet 4A and flow outlet 4B of the filter 4 respectively. The pressure of effluent across the filter can be controlled by a variable valve 8 which controls the flow of effluent out of outlet 4B.

Clean cutting fluid permeate is fed out of the side wall of the filter 4 through a permeate outlet 9 and passes through a two way valve 10. In a first position, valve 10 allows permeate to pass out through the valve 10 and exit through feed pipe 11. In a second position, valve 10 allows compressed air to enter the outlet 9 from a compressor 12, as more fully described below, to clean the filter 4. Filter 4, pump 6 and compressor 12 may be mounted on a frame 13 optionally with wheels (not shown). A permeate flow control valve 14 controls the flow of permeate through pipe 11 and hence the back pressure across the filter.

In use, the effluent is circulated through the filter 4 and the volume of effluent is slowly reduced as clean cutting fluid is extracted, and the container will eventually contain a high percentage of metal particles which can be discarded. The container can then be filled again with waste cutting fluid and the process repeated.

The filter 4 is shown now more fully in Figure 2. Filter 4 has an elongate tubular ceramic filter 20 containing a number of conduits therein 20A. One end of the filter conduits is connected to receive effluent from the filter flow inlet 4A, and the other end of the filter conduits is connected to flow outlet 4B.

An inner tube 21 defines an inner hollow chamber 22 and lies concentrically around the filter 20. Chamber 22 has a sealed end 22A and an open end 22B. An outer tube 23 defines an outer hollow chamber 24 which surrounds the inner chamber 21 concentrically. Outer hollow chamber

24 has an inlet 24A connected to the inner chamber open end 22B and an outlet 24B leading to filter permeate outlet 9.

Seals 25A,25B seal the ends of the ceramic filter from the inner and outer chambers 22,24 preventing effluent from entering the chambers.

In use effluent to be filtered passes under pressure through the ceramic filter conduits from the flow inlet to the flow outlet. Permeate is filtered through the walls of the conduits into the inner chamber 22. It then flows out the inner chamber open end 22B into the outer hollow chamber inlet 24A as shown by the arrows. Clean permeate exits through outer chamber outlet 24B.

As effluent is filtered, so a build up of particles is formed on the membrane of the conduits reducing the efficiency of the ceramic filter 20. These particles can be removed by turning pump 6 off and placing two way valve 10 into its second position thereby connecting the compressed air 12 to the outer chamber 24. Outer chamber 24 acts as a reservoir and clean fluid from it is forced back through the ceramic filter back into the conduits so dislodging the build up of particles and thus cleaning the ceramic filter.

It is envisaged that the two way valve 10 will be operated automatically, for example with the compressed air being connected to the outer chamber 24 and pump 6 turned off for a few seconds every 10 minutes or so of operation of the filter.



The provision of the outer chamber prevents air entering the ceramic filter and obviates the need for a separate reservoir with the addition of complex control valves.

The invention may take a form different to that specifically described above. For example the ceramic filter may have more or less conduits. The filter may be used to filter fluid other than cutting fluid e.g. other coolants or oil and water mixtures.

Further modifications of the invention will be apparent to those skilled in the art without departing from the scope of the present invention.

CLAIMS

1. A liquid filter to filter effluent into permeate comprising:

- a) a ceramic filter containing one or more hollow conduits therein, one end of the filter conduit/ being connected to a filter flow inlet and the other end providing a flow outlet,
- b) an inner hollow chamber around the filter having a sealed and open end,
- c) an outer hollow chamber around the inner chamber, said outer hollow chamber having an inlet connected to the inner chamber open end and having an outlet forming said filter permeate outlet, and

d) means to connect a supply of compressed air to the outer hollow chamber, in use effluent to be filtered passes under pressure through the ceramic filter conduit/s from the flow inlet to the flow outlet, and permeate is filtered out into the inner chamber and then flows into said outer hollow chamber, the outer hollow chamber forming a reservoir of clean permeate to be forced back through the ceramic filter by means of said compressed air to clean the filter.

2. A liquid filter according to claim 1 wherein the ceramic filter is an elongate tube, and said inner and outer chambers are created by concentric tubes about said filter.

3. A liquid filter according to claim 1 or 2 wherein a control valve is provided to control the flow of effluent through said flow outlet whereby to alter the pressure of effluent in the ceramic filter conduit/s.

4. A liquid filter according to claim 1, 2, or 3 wherein a two way valve is connected to the outer chamber outlet having a first position allowing the flow of permeate from the permeate outlet, and a second position connecting the supply of compressed air to the permeate outlet.

5. A liquid filter according to claim 4 wherein automatic operation means are provided to operate the control valve whereby the control valve is normally in said first position allowing flow of permeate from the permeate outlet and the control valve is periodically changed to its second position for a predetermined short interval.

6. A liquid filter according to claim 5 wherein said automatic operation means further turns off a pump pressurising effluent being passed through the filter.

7. A liquid filter substantially as hereinbefore described with reference to and as shown in the accompanying drawings.



Application No: GB 0027137.9  
Claims searched: 1 - 7

Examiner: Peter Macey  
Date of search: 2 October 2001

## Patents Act 1977 Search Report under Section 17

### Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.S): B1D (DNCK, DNCL, DDXB)

Int Cl (Ed.7): B01D 29/66, 29/68

Other: Online: WPI, EPODOC, JAPIO

### Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	GB 2335150 A (BARTH) see figure 1	-
A	US 3637079 (STRUB) see figure 1	-

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

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